Study of mechanical response of viscous materials using the nanoindentation technique

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Abstract: Nanoindentation is a usually used method for determining mechanical properties of materials, such as hardness, and elastic modulus. This paper presents a study of the crystallinity effect on the variation of nanoscale mechanical properties of two polymers that are polypropylene (PP) and polylactic acid (PLA). Nano-indentation tests with standard spherical indenter were performed on polymers samples to study the viscoelasticity effects. Tests under cyclic loading revealed the effect of cyclic contact on the mechanical response of both PP and PLA materials. These cyclic tests contain both a loading step, a holding time at the maximum load, an unloading step and another holding time at a minimum load. The creep of the deformation can be observed during the two phases of holding.

Keywords: Nanoindentation, polymers, elastic modulus, viscoelasticity, creep